

Project Name: ShakeCast
OCIO Project #:
Department: Transportation
Revision Date: 9/15/10

Concept Statement

Description

Brief description of the proposed project:

ShakeCast, short for ShakeMap Broadcast, was developed in the mid-2000s by the United States Geologic Survey (USGS) as a tool to support dissemination and use of ShakeMap products. ShakeMap is a system for automatically generating maps of ground motion from instrumental recordings immediately following an earthquake. ShakeCast is a fully automated open-sourced system for delivering specific ShakeMap products to users and for triggering established post-earthquake response protocols. ShakeCast allows infrastructure owner/operators to automatically determine the shaking value at their facilities, set thresholds for notification of damage states for each facility and then automatically notify (via pager, cell phone, or email) specified operators, inspectors, inspectors, and others within their organizations responsibility for those particular facilities in order to prioritize inspection and response. This project will enhance ShakeCast version 2 to include additional and enhanced level of analysis.

Need Statement

High Level Functional Requirements:

- Component-based bridge fragility analysis framework.
- Full statistical interpretation of bridge fragility curves.
- Polygon/polyline facility location delineation method.
- Landslide hazard analysis function.
- Liquefaction hazard analysis function.
- Method to present results for various facility groupings.
- User-defined HTML facility attribute for display on website.
- Automatic generation of large-scale printable map as a standard ShakeCast product.
- A recommendation for IT server deployment at Caltrans for internal use.
- Troubleshooting support and implementation of interface enhancements.

What is Driving This Need?

Although ShakeCast currently delivers critical earthquake data and bridge analysis information to responders, three primary issues remain:

- The current bridge fragility data model supported by ShakeCast limits the level of analysis and prioritization possible.
- Several new and important features have been requested by key stakeholders to allow a more comprehensive evaluation of the highway infrastructure due to other earthquake generated hazards (e.g. landslides and liquefaction).
- A sustainable maintenance and IT implementation strategy is needed.

It is proposed to pursue a followup contract with the United States Geological Survey (USGS), the original developer of ShakeCast (versions 1 and 2), to develop, deploy and support an enhanced version of ShakeCast (version 3) within Caltrans. An enhanced version is needed to add behind-the-scenes capabilities and flexibility to accommodate a broader range of bridges and user-group information that will enable dissemination of more informative, accurate, and tailored messages per requirements of Caltrans stakeholders.

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Risk to the Organization if This Work is Not Done:

If this work is not carried out, Caltrans responders would continue to receive ShakeCast services as they do currently. But, long-term sustainability of the system is dependent upon Division of Research & Innovation (DRI) resources for continued support of the system. This includes funding for equipment and materials as well as staff support for ShakeCast. Redirection of staff, insufficient funding for hardware upgrades, lack of contract for USGS technical support, or failure to develop a sound IT deployment plan, could jeopardize continued and reliable ShakeCast services for Caltrans responders. Furthermore, if this work is not pursued, ShakeCast cannot be enhanced to implement comprehensive evaluation of the highway infrastructure due to other earthquake generated hazards (e.g. landslides and liquefaction). Nor, will ShakeCast support the more advanced bridge fragilities needed for a more rigorous analysis.

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Benefit Statement

Intangible Benefits

Process Improvements (describe the nature of the process improvement):

- | |
|---|
| <ol style="list-style-type: none">1. ShakeCast Phase 3 will add a scenario planning and evaluation tool, that can generate any number of possible earthquake situations and analyze the performance of the bridge inventory.2. Improvements to bridges (e.g. seismic strengthening) can be tested against past and scenario earthquakes to assess effectiveness of the improvements. |
|---|

Other Intangible Benefits:

- | |
|---|
| <ol style="list-style-type: none">1. ShakeCast provides a more focused post-earthquake response.2. ShakeCast allows for more effective use of limited staff resources.3. Caltrans management is better informed and can communicate the post bridge inspection situation.4. District Traffic Management Centers (TMC) and Emergency Operation Centers (EOC) are informed so they can more effectively coordinate with the California Highway Patrol (CHP). |
|---|

Tangible Benefits

Revenue Generation (describe how revenue will be generated):

To Be Determined in the Feasibility Study.
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Cost Savings (describe how cost will be reduced):
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To Be Determined in the Feasibility Study.
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Cost Avoidance (describe the cost and how avoided):

To Be Determined in the Feasibility Study.


Risk Avoidance (describe the risk and how avoided):

To Be Determined in the Feasibility Study.

Improved Services:

1. The new tools and information provided by this phase of ShakeCast may result in changes to emergency response procedures at headquarters and in the Districts.

Consistency

"No" Responses 		Rationale	Action Required
Enterprise Architecture	Yes		
Business Plan	Yes		
Strategic Plan	Yes		

Impact to Other Entities

Nature of Impact to Other Entities

Entity: California Department of Water Resources

Describe the nature of the impact:

ShakeCast provides data on dams within the earthquake analysis tools.

Entity: Los Angeles Unified School District

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Describe the nature of the impact:
ShakeCast provides an analysis of the school buildings within the school district. The new version of the tools provide a possibility that the involvement will lead to a more formalized partnerships in extending ShakeCast functionality.

Entity: Walmart
Describe the nature of the impact:
Walmart uses the ShakeCast analysis to determine the earthquake impact on their store buildings and facilities.

Entity:
Describe the nature of the impact:

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Solution Alternatives

Alternative 1:
To Be Determined in the Feasibility Study.

Technical Considerations for Alternative 1:	
ROM Cost:	Note: high end of range must not exceed 200% of low end of range

Alternative 2:

Technical Considerations for Alternative 2:	
ROM Cost:	Note: high end of range must not exceed 200% of low end of range

Alternative 3:

CA - PMM

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Technical Considerations for Alternative 3:		
ROM Cost:	to	Note: high end of range must not exceed 200% of low end of range

Recommendation

Comparison:

Alternative 1	ROM Cost	Risk
	\$0 - \$0	
Alternative 2	ROM Cost	Risk
	\$0 - \$0	
Alternative 3	ROM Cost	Risk
	\$0 - \$0	

Conclusions:

1	
2	
3	
4	

CA - PMM

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Recommendation:

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Project Approach (if known)

System Complexity:			System Business Hours: (e.g., 24x7, 9am-5pm) :		To Be Determine in the Feasibility Study.	
Architecture	<input type="checkbox"/> Mainframe	<input type="checkbox"/> Client Server	<input type="checkbox"/> Web Based		Num. of New Databases:	
Technology	<input type="checkbox"/> New	<input type="checkbox"/> New to Staff	<input type="checkbox"/> In-House Experience		Interfaces:	
Implementation	<input type="checkbox"/> Central Site	<input type="checkbox"/> Phased Roll-out			Num. of Sites:	
M & O Support	<input type="checkbox"/> Contractor	<input type="checkbox"/> Data Center	<input type="checkbox"/> Project	<input type="checkbox"/> In House		
Procurement Approach:					Number of Procurements:	
Open Procurement?		Delegated Procurement?				
Scope of Contract	<input type="checkbox"/> Development <input type="checkbox"/> Implementation <input type="checkbox"/> M & O <input type="checkbox"/> Other: _____					
Anticipated Length of Contract:		_____ Years / _____ extensions for _____ years				